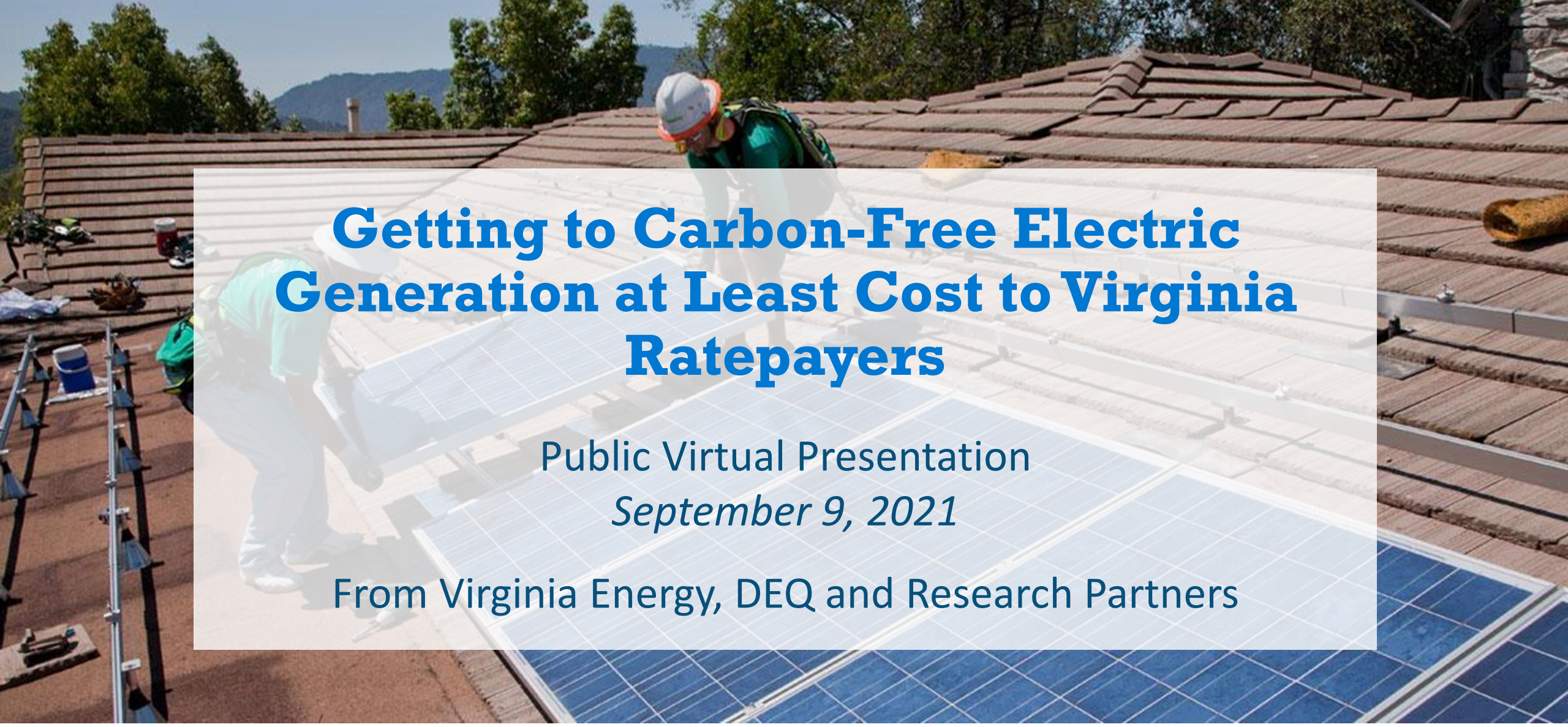

Getting to Carbon-Free Electric Generation at Least Cost to Virginia Ratepayers

Public Virtual Presentation

September 9, 2021

From Virginia Energy, DEQ and Research Partners

VIRGINIA Energy

CLEAN ENERGY VIRGINIA

Decarbonization Modeling Report

Virginia Clean Economy Act (2020)

- Directs the Secretaries of Natural Resources and Commerce & Trade, in consultation with the State Corporation Commission (SCC) and the EJ Council, to report to the General Assembly (GA) by January 1, 2022, any recommendations on how to achieve 100 percent carbon-free electric energy generation by 2045 at least cost for ratepayers.
- Such report shall include a recommendation on whether the GA should permanently ban the construction of new fossil fuel-based electric generation facilities.

VCEA Language (2020)

*6. That in developing a plan to reduce carbon dioxide emissions from covered units described in § **10.1-1308** of the Code of Virginia, as amended by this act, the Secretary of Natural Resources and the Secretary of Commerce and Trade, in consultation with the State Corporation Commission and the Council on Environmental Justice and appropriate stakeholders, shall report to the General Assembly by January 1, 2022, any recommendations on how to achieve 100 percent carbon-free electric energy generation by 2045 at least cost for ratepayers.*

Such report shall include a recommendation on whether the General Assembly should permanently repeal the ability to obtain a certificate of public convenience and necessity for any electric generating unit that emits carbon as a by-product of combusting fuel to generate electricity.

Until the General Assembly receives such report, the State Corporation Commission shall not issue a certificate of public convenience and necessity for any investor-owned utility to own, operate, or construct any electric generating unit that emits carbon as a by-product of combusting fuel to generate electricity.

Process and Project Partners

- DMME is taking lead on the project by coordinating research, conducting key consultations, engaging the public, drafting recommendations and working with DEQ and the Secretary offices to finalize the submission to the General Assembly.
- Project partners include DEQ, Resources for the Future, UVA Weldon Cooper Center for Public Service and Georgetown Climate Center.
- Additional public comment will be solicited in the coming weeks (e.g. webinar and supporting communication channels).
- Final report due to GA by January 1, 2022.

2022: Community Burden Analysis

- Virginia Clean Economy Act (2020)
- Beginning next year (September 1, 2022) and every three years thereafter, DMME, in consultation with the EJ Council and appropriate stakeholders, shall determine whether implementation of the VCEA imposes a disproportionate burden on historically economically disadvantaged communities.
- Final report to the GA due by January 1, 2023, and every three years thereafter.

Today: Input on Modeling, Report

- Modeling team will present results
- Questions, comments or recommendations on the modeling or the final report may be submitting in writing, using “Q&A” feature
- Moderated discussion will follow presentation
- Public comment may be submitted by email to Virginia Energy no later than Saturday, October 9th
  - modeling@dmme.Virginia.gov
  - https://dmme.virginia.gov/decarbonization.shtml

VIRGINIA Energy

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Questions? Contact

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Modeling for Legislatively Mandated Report on Virginia's Clean Energy Goals

Dallas Burtraw, Maya Domeshek, Karen Palmer, Nick Roy / RFF
Franz Litz, James Bradbury / Georgetown Climate Center
Bill Shobe, Anthony Artuso, Art Small / University of Virginia

Public Webinar Presentation

September 9, 2021

Presentation Roadmap

- Introduction
- Context for this work under Virginia's Clean Economy Act (VCEA)
- The reference case outcome under the VCEA
- Initial sensitivity case with higher electricity demand
- Process for completing the report
- Discussion

Mandate for the Report

The VCEA commissions a report to the General Assembly due by January 1, 2022, that in consultation with the Council on Environmental Justice, State Corporation Commission and other appropriate stakeholders includes “recommendations on how to achieve 100 percent carbon free electric energy generation by 2045 at least cost for ratepayers.”

Details of the Virginia Clean Economy Act :

- Greatly expands construction of solar, onshore wind, offshore wind, and energy storage with 35% of these facilities owned by entities other than Dominion
- Establishes a schedule for retiring all carbon-emitting generating units by 2045
- Establishes a standard for 100% renewables by 2045 (Dominion) or 2050 (APCo)
- Establishes an energy efficiency resource standard (affecting all customers) growing to 5%/year (Dominion) or 2% (APCo) by 2025, to be subsequently revised

Modeling to Support the Report

We have two principal questions:

- What electricity sector emissions pathway will the existing requirements of the VCEA achieve?
- What additional measures, if any, are necessary to achieve the VCEA emissions goal (zero carbon emissions by 2045) at least cost (including environmental cost)?

How the Model Works

Inputs:
- Existing Power Plants
- Planned New Investments
- Fuel Costs
- Operations and Maintenance Costs
- Capital Costs of New Plants
- Transmission Capability
- Solar and Wind Availability
- Annual Demand in 24 Time Blocks

Haiku Model

Outputs:
- Additional Power Plant Investments
- Generation by Power Plants
- Emissions
- Resource Costs

Modeling will cover the 2020-2040 time period

Modeling Approach

Reference case includes:

- VCEA requirements:
  - Renewable procurement
  - Renewable portfolio standard
  - Energy efficiency provisions
- 12-State RGGI (with Pennsylvania)

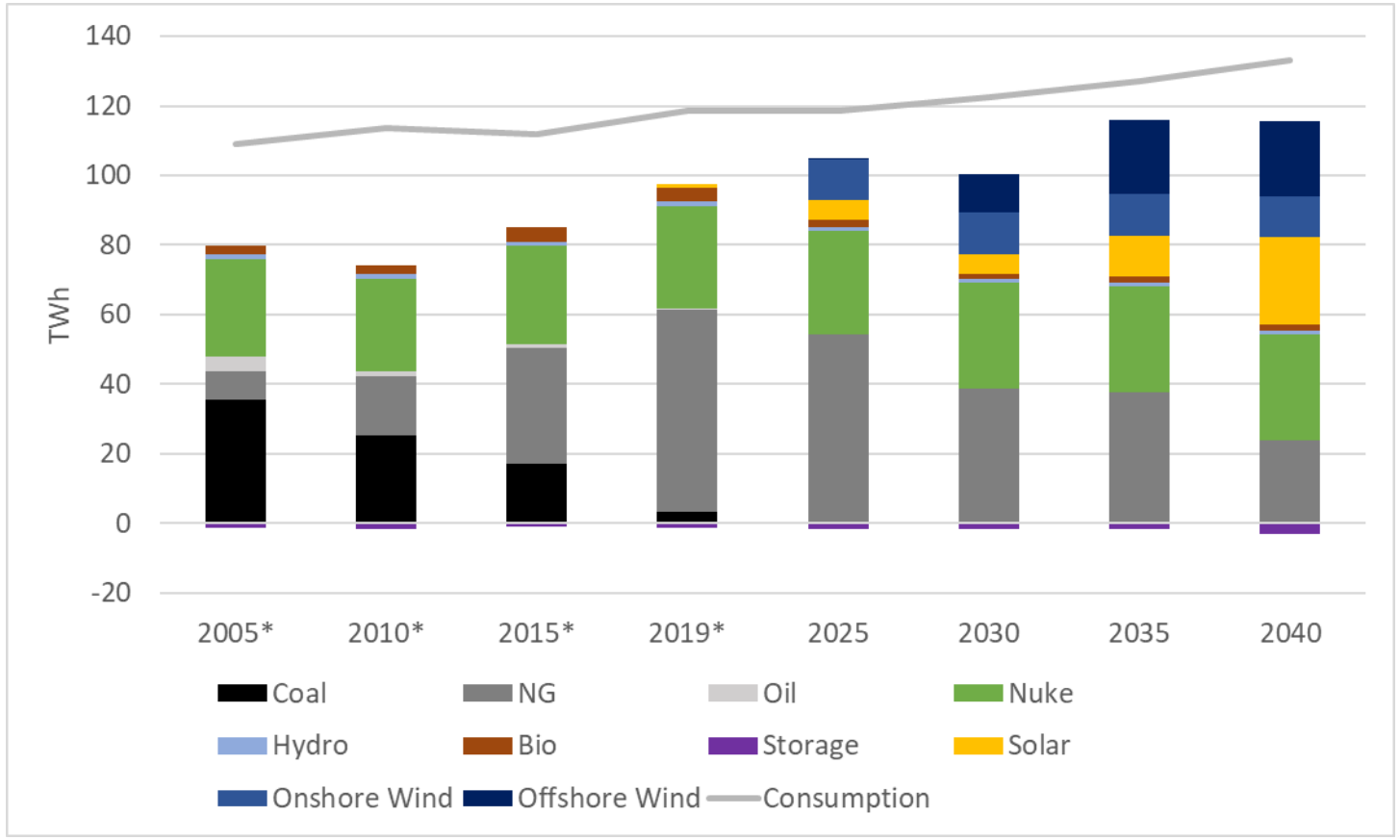
Sensitivity cases will analyze alternative:

- Natural gas prices
- Levels of demand
- Federal policies

Policy cases will analyze:

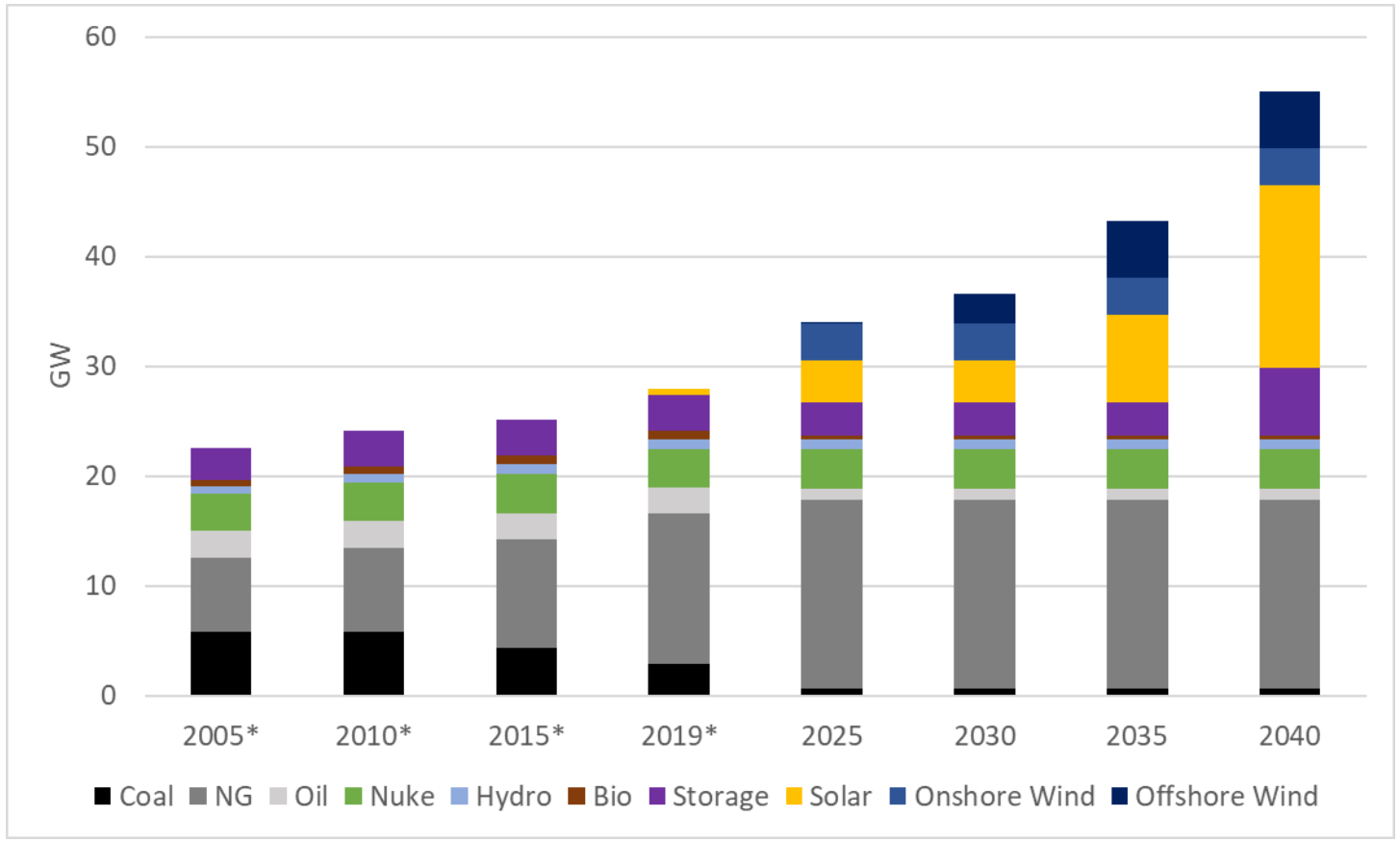
- Potential additional measures, if any, necessary to achieve the VCEA emissions goal

Expected Electricity Generation in Virginia Through 2040



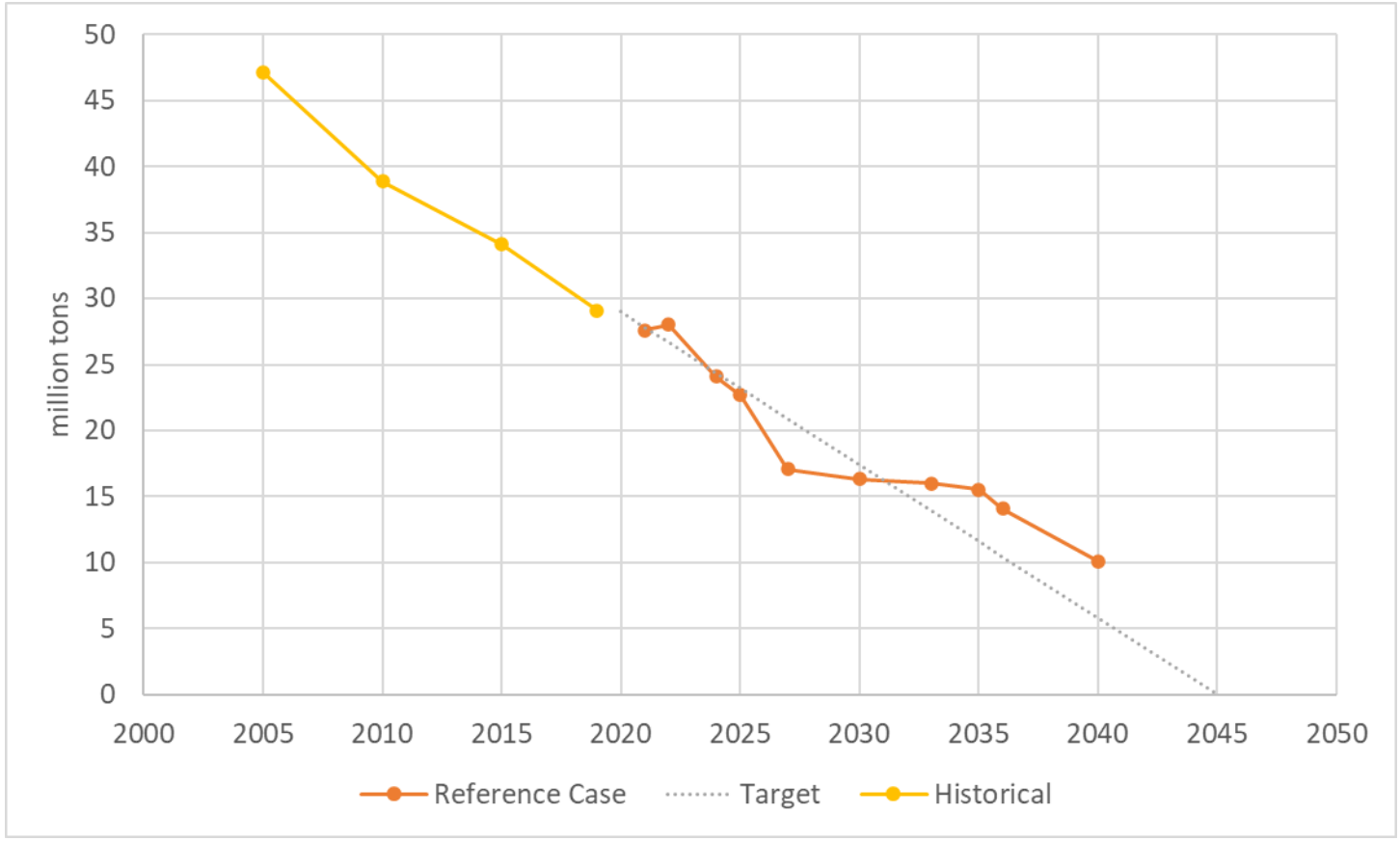
- New wind and solar constitute roughly half of all generation in Virginia by 2040
- Coal generation falls to very low levels in Virginia by 2030

Expected Power Plant Capacity in Virginia through 2040



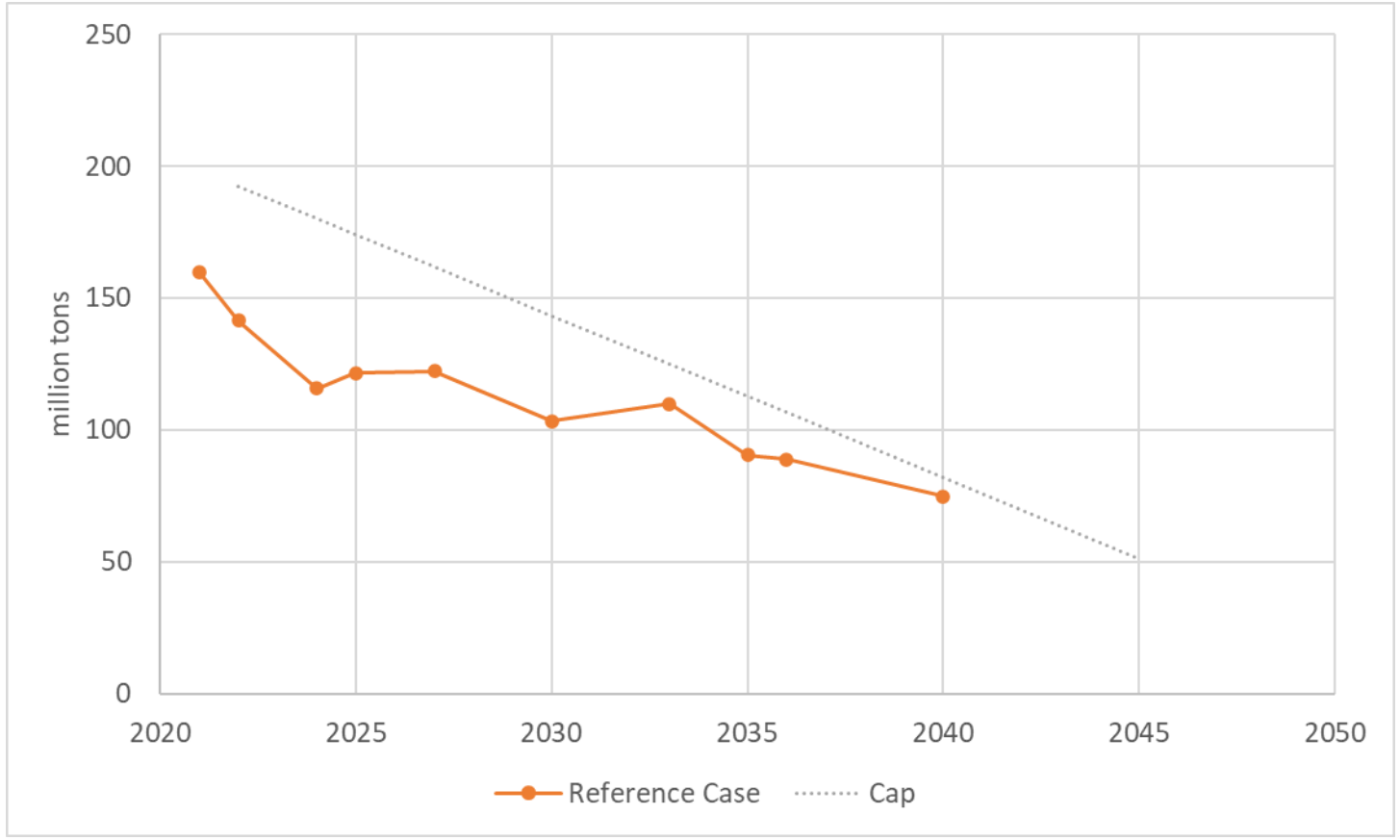
- Renewable capacity grows with capacity targets
- Natural gas capacity survives through 2040, although with diminishing utilization

Expected CO_2 Emissions in Virginia through 2040 with VCEA Goals



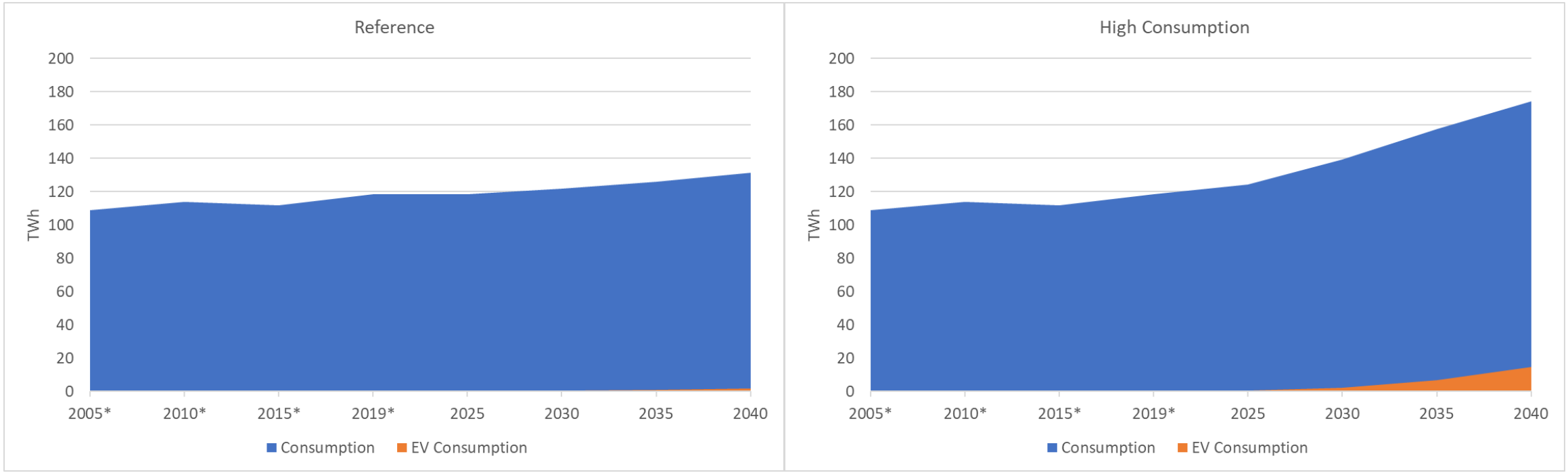
- VCEA policies extend and continue emissions trends since 2005

Expected CO_2 Emissions in the Twelve State RGGI Region through 2040

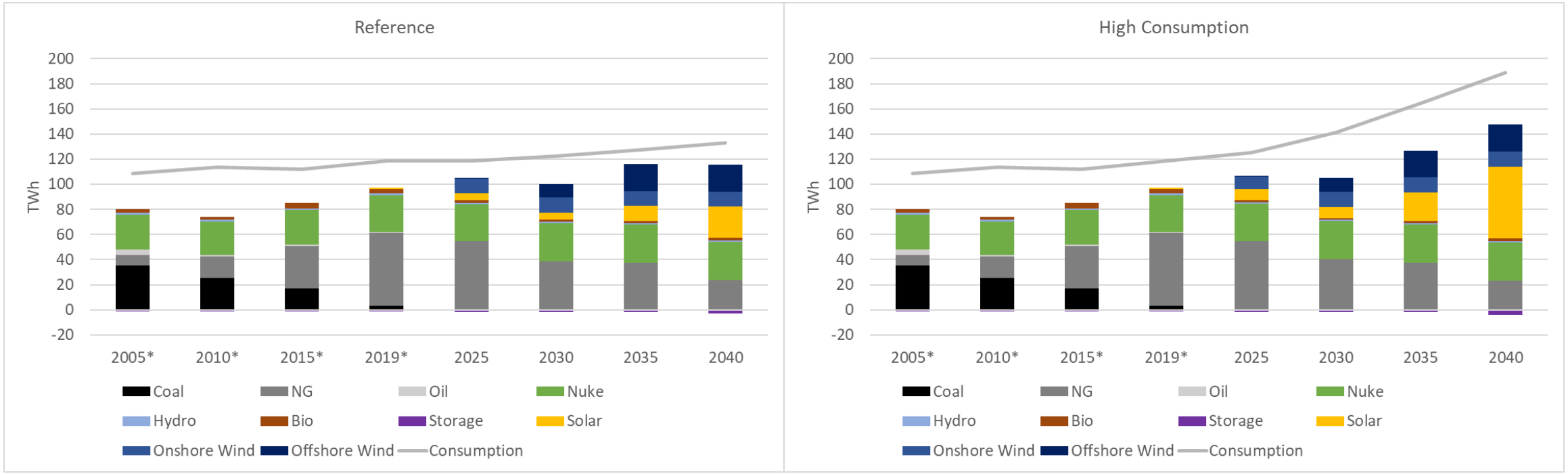


- The VCEA helps the twelve-state RGGI region achieve its cap, if extended at the current pace out from 2030.

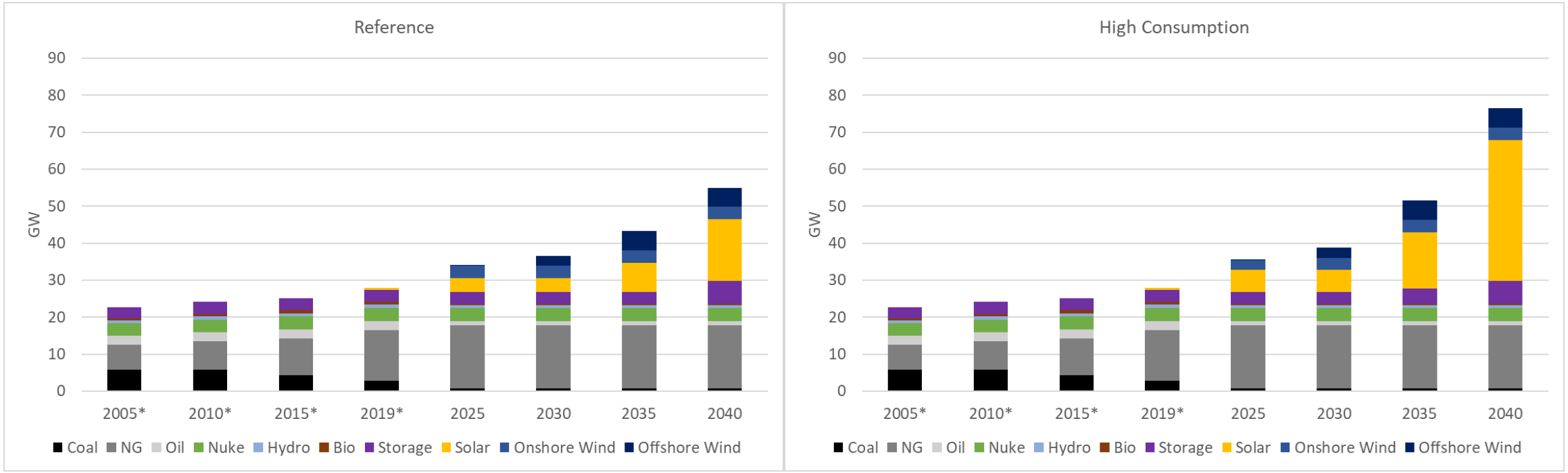
High Demand Sensitivity: Expected Electricity Demand in Virginia Through 2040



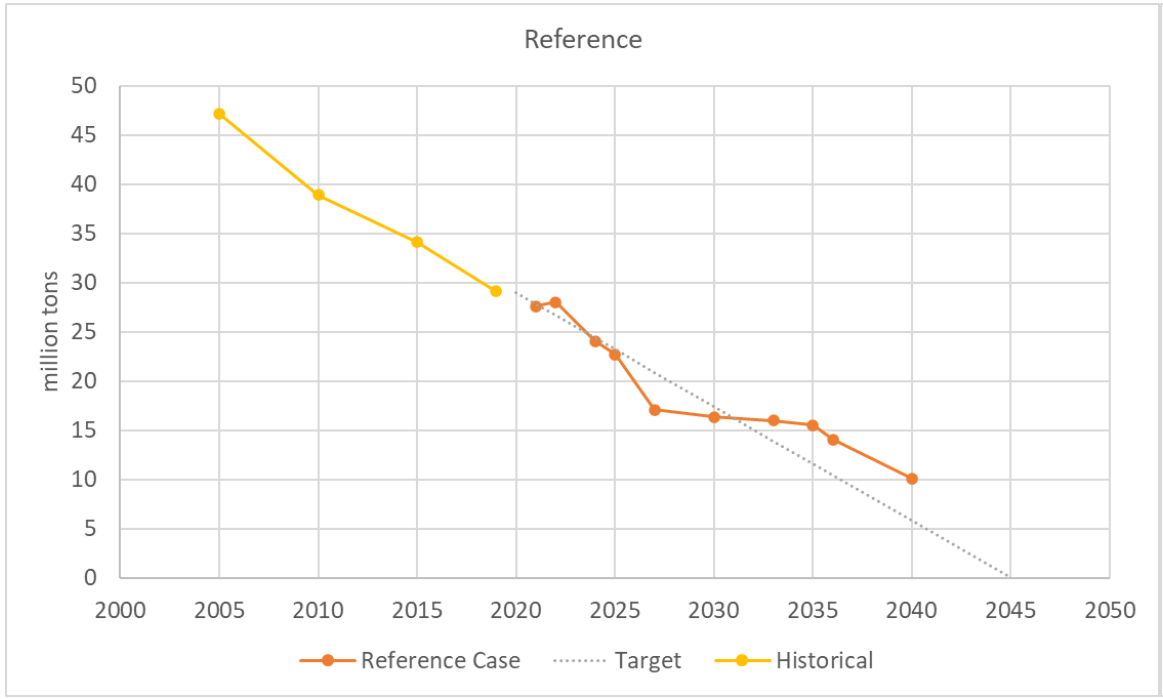
High Demand Sensitivity: Expected Electricity Generation in Virginia Through 2040

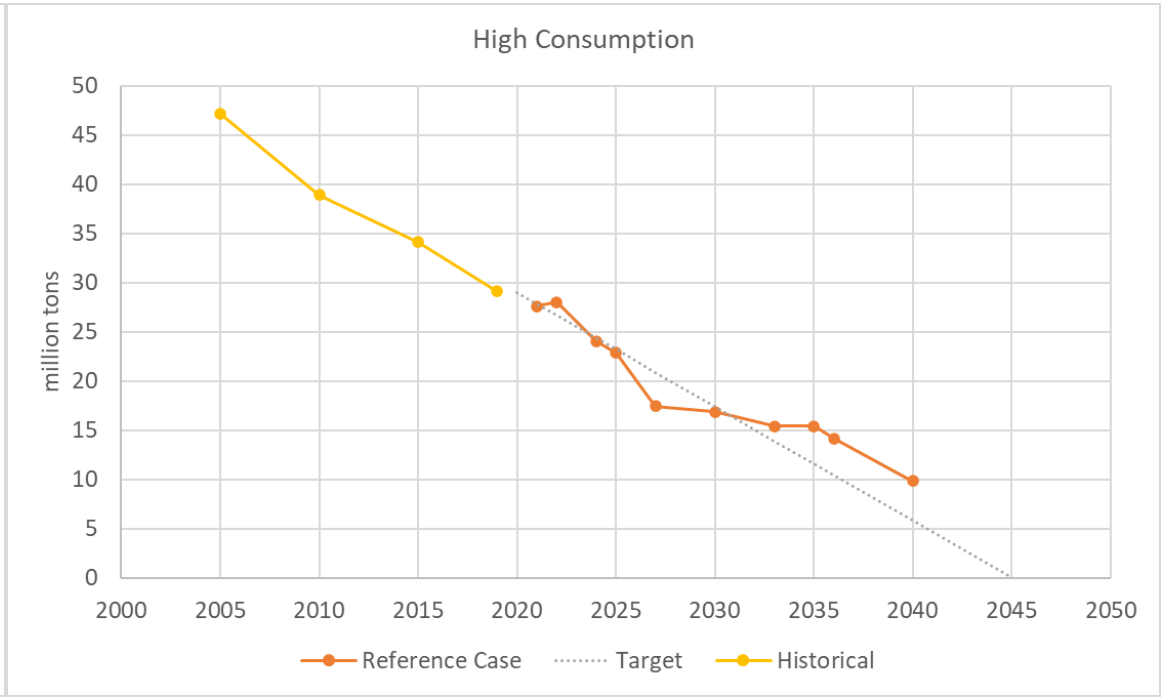


High Demand Sensitivity: Expected Power Plant Capacity in Virginia Through 2040



High Demand Sensitivity: Expected CO_2 Emissions in Virginia through 2040 with VCEA Goals





Scenarios under Consideration

Sensitivity Scenario	Specification	Motivation
1. Higher demand	The following, in combination: • UVA high demand scenario • High national demand	• Data center growth • Electrification including EVs
2. Federal policies	The following, in combination: • PTC extension (CEAA) • CEPP modeled as CES with banking to achieve 90% clean in 2040	• Report could be completed in time to influence delegation from VA • This CEPP scenario will achieve close to 80% clean in 2030
3. Demand *with* federal policies	• Combine #1 & #2	• The EV portion of demand growth would be accelerated by the federal policies
4. Lower gas/ higher renewable costs	The following, in combination: • Higher renewable capital costs • Lower natural gas prices	• Higher renewable costs partially represents difficulties with siting
Policy Scenario	Specification	Motivation
A. Lower demand	• Higher energy efficiency	• EE goals greater than VCEA

- Each scenario analyzes, among other things, the relationship between importing clean energy compared to the benefits of in-state investment and job creation.

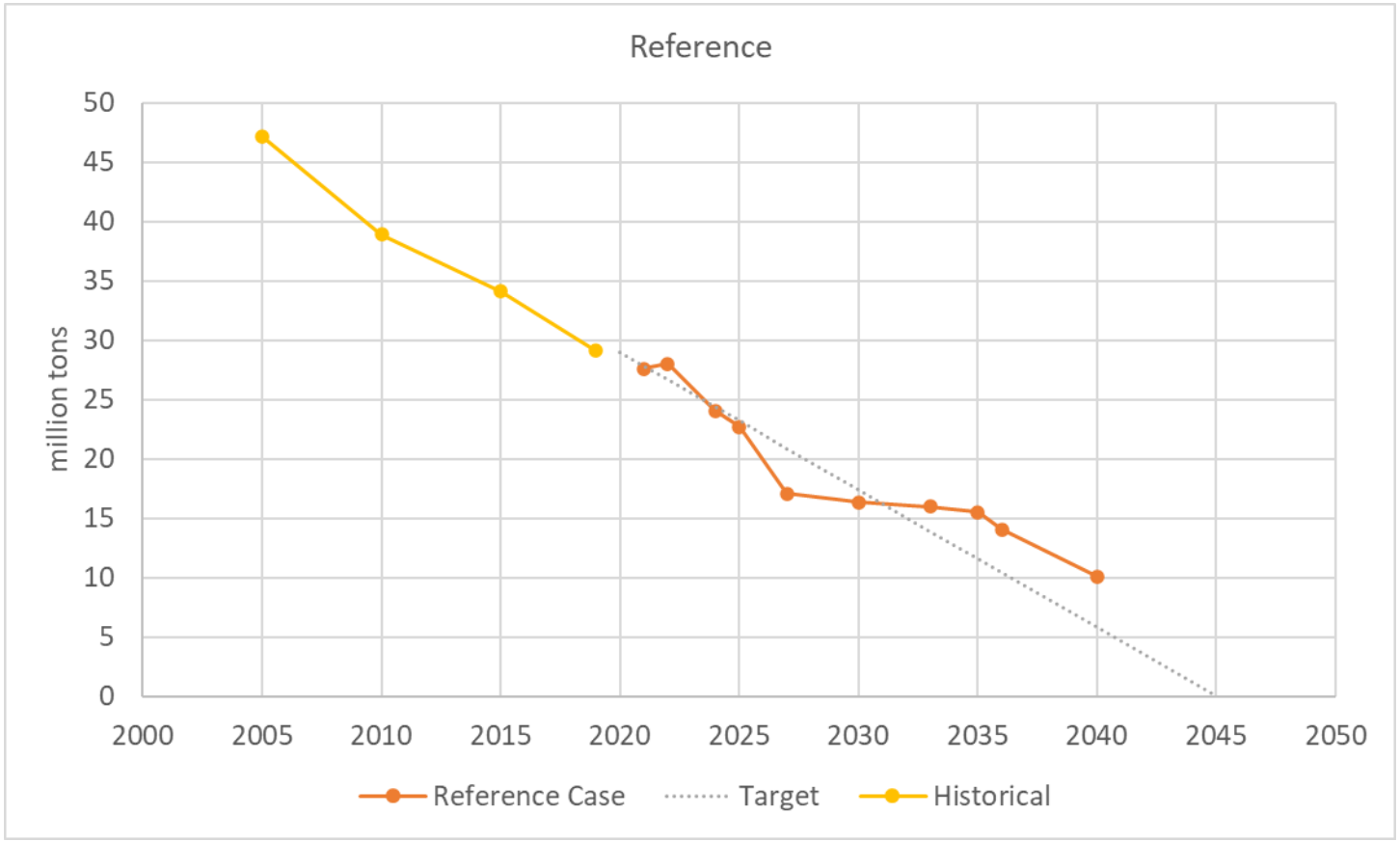
Process and Next Steps

- By the end of September, the modeling team will complete sensitivity analysis and evaluation of other scenarios to develop policy options for possible inclusion in the report.
- The DMME will provide opportunities for stakeholder input on the modeling results.
- University of Virginia's Weldon Cooper Center for Public Service will lead in completing a draft report to DMME.
- DMME will report results and recommendations to the General Assembly.

Additional Resources

- *Decarbonizing Virginia's Economy: Pathways to 2050*. (Jan. 2021) William Shobe, Arthur Small, Anthony Artuso, Ben Haley and Gabe Kwok. Weldon Cooper Center for Public Service, Univ. of Virginia. https://energytransition.coopercenter.org/reports/decarbonizing-virginia-pathways-2050

DISCUSSION

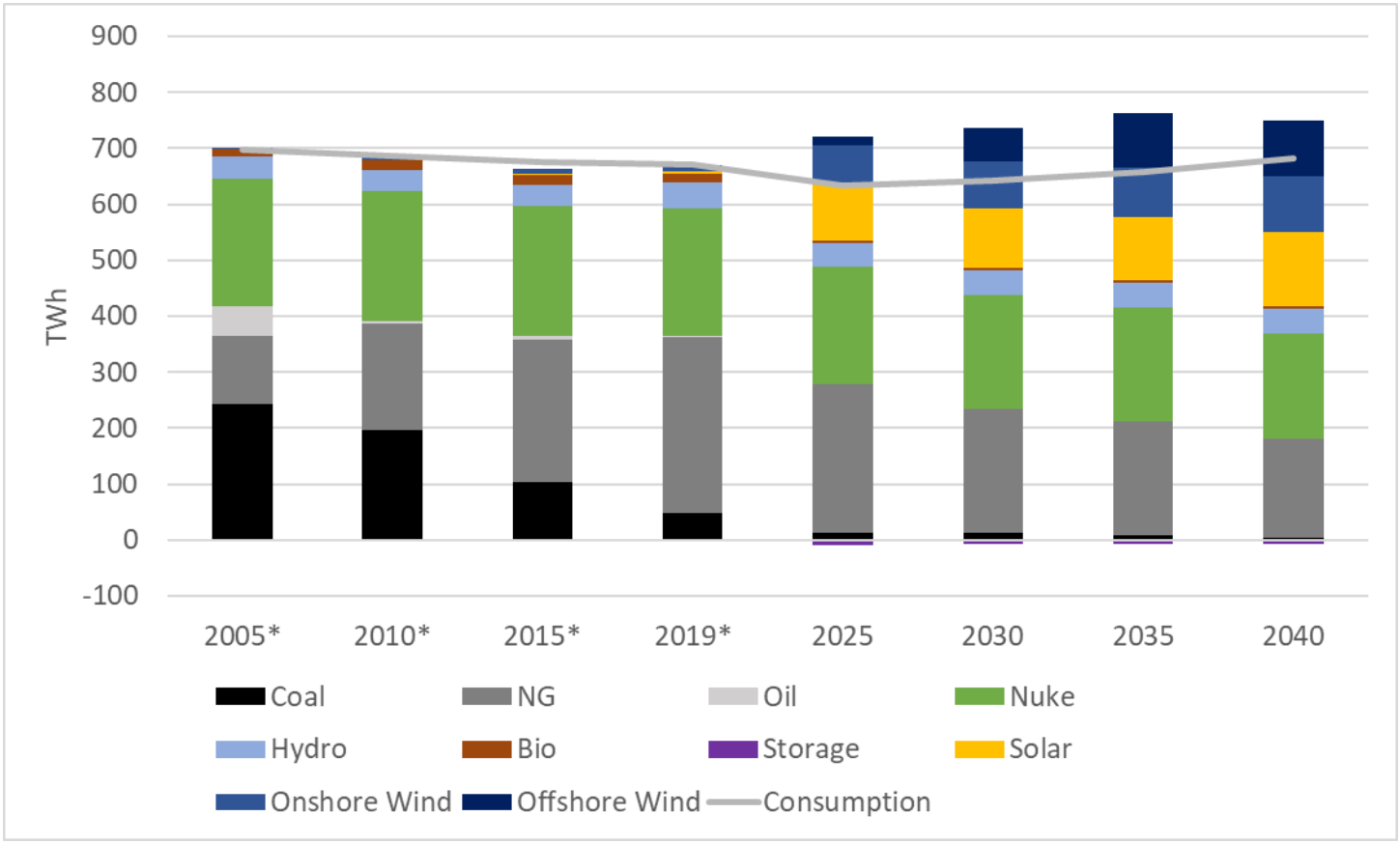


- The VCEA puts us almost on the trajectory to zero by 2045
- Do we have the key assumptions right that get us to these results?
- What potential additional policy measures do we consider to close the gap? When should additional policies be considered?
- What additional matters should the report drafters take into account?
- Other thoughts or questions?

Important Reference Case Assumptions

Category	Source/Approach for Reference Case Assumptions
Haiku Reporting Years	Reporting years for the model: 2021, 2022, 2023, 2024, 2025, 2027, 2030, 2033, 2035, 2036, 2040
Demand - Load and Peak Growth	Demand from Energy Information Administration 2021 Annual Energy Outlook
Gas Prices	Annual Energy Outlook 2021 Reference Case gas prices
Build Costs - Renewables	National Renewable Energy Laboratory 2020 mid-cost scenario for renewable overnight capital costs
Minimum Generation	Minimum Generation for some technologies such as Combined Heat and Power and Conventional Hydro Minimum / maximum generation at VA coal plants from Dominion IRP
Maximum Generation	VA pumped storage has seasonal maximum generation based on historical generation
Firm Capacity Changes	Latest information from S&P Global Market Intelligence VA - Any additional capacity changes not accounted for in S&P Global
Nuclear Lifetime	80 years, or as planned by owners
Renewable Portfolio Standards (RPS)	State-level RPS for all states with statutory RPSs VA: 100% by 2050. Remove nuclear and data centers from denominator. Allow 25% of RECs to come from outside of VA after 2025. Alternative Compliance Payment of $45
Solar & Onshore Wind Procurement	From the VCEA: VA: 16,100 MW of combined solar and onshore wind 2036
Offshore Wind/Storage Requirements	Minimum based on input from the states and expectations based on state policies/announcements NY: 9,000 MW Offshore Wind by 2035 / 3,000 MW Storage by 2030 MA: 3,200 MW Offshore Wind by 2030/ 1,000 MW Storage by 2025 CT: 2,000 MW Offshore Wind by 2030 RI: 400 MW Offshore Wind by 2030 MD: 1,568 MW Offshore Wind by 2030 NJ: 4,000 MW Offshore Wind by 2030 / 2,000 MW Storage by 2030 VA: 2,600 MW Offshore Wind by 2026, 5,200 by 2035 / 3,100 MW Storage by 2035
RGGI Program Assumptions	11 Current RGGI States + PA. Emissions cap declines 3% per year of 2020 levels (NJ 2021, VA 2021, PA 2022)
EE Assumptions	VCEA EERS flat after 2025 removed from AEO demand projections

Expected Electricity Generation in the Twelve State RGGI Region Through 2040



- Coal generation falls to low levels throughout RGGI by 2030

Expected Power Plant Capacity in the Twelve State RGGI Region Through 2040